

cattle with a flat poll (as in the modern Galloway and in polled Cadzow cattle) obviously belong to the Urus type, while those with a mesial prominence seem to belong to the *frontosus* type of Nilsson. As there were hornless cattle in Egypt as early as the Fourth Dynasty, we are not likely soon to ascertain where or when polled breeds originated. There is no evidence that any of the varieties of polled cattle are descended from hornless wild ancestors; neither is there certain evidence of a pure horned race suddenly producing polled offspring. If, as seems highly probable, the absence of horns is not due to reversion, the polled condition was either acquired by the gradual reduction in the size of the horns or suddenly, *i. e.* by mutation. In polled breeds which now and then produce individuals with "loose horns" the polled condition was perhaps acquired slowly, while in polled breeds in which "scurrs" are unknown the polled condition was perhaps due to a mutation. Though the Galloway and the white polled "wild" Cadzow cattle may have descended from *Bos primigenius*, the white polled Somerford, and the round polled Aberdeen-Angus cattle with the premaxillæ extending well up between the maxillæ and nasals, may be the descendants of an Oriental race allied to a modern Syrian breed apparently in the act of losing the horns.

13. Plankton from Christmas Island, Indian Ocean.—I. On Copepoda of the Family *Coryceidae*. By GEORGE P. FARRAN*.

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(Plates X.—XIV. †)

Through the kindness of Dr. W. T. Calman I have had the opportunity of examining the Copepoda of a small collection (8 bottles) of Plankton, made by Sir John Murray, K.C.B., F.R.S., and Dr. C. W. Andrews, F.R.S., at Christmas Island in the Indian Ocean, and presented to the British Museum by Sir J. Murray.

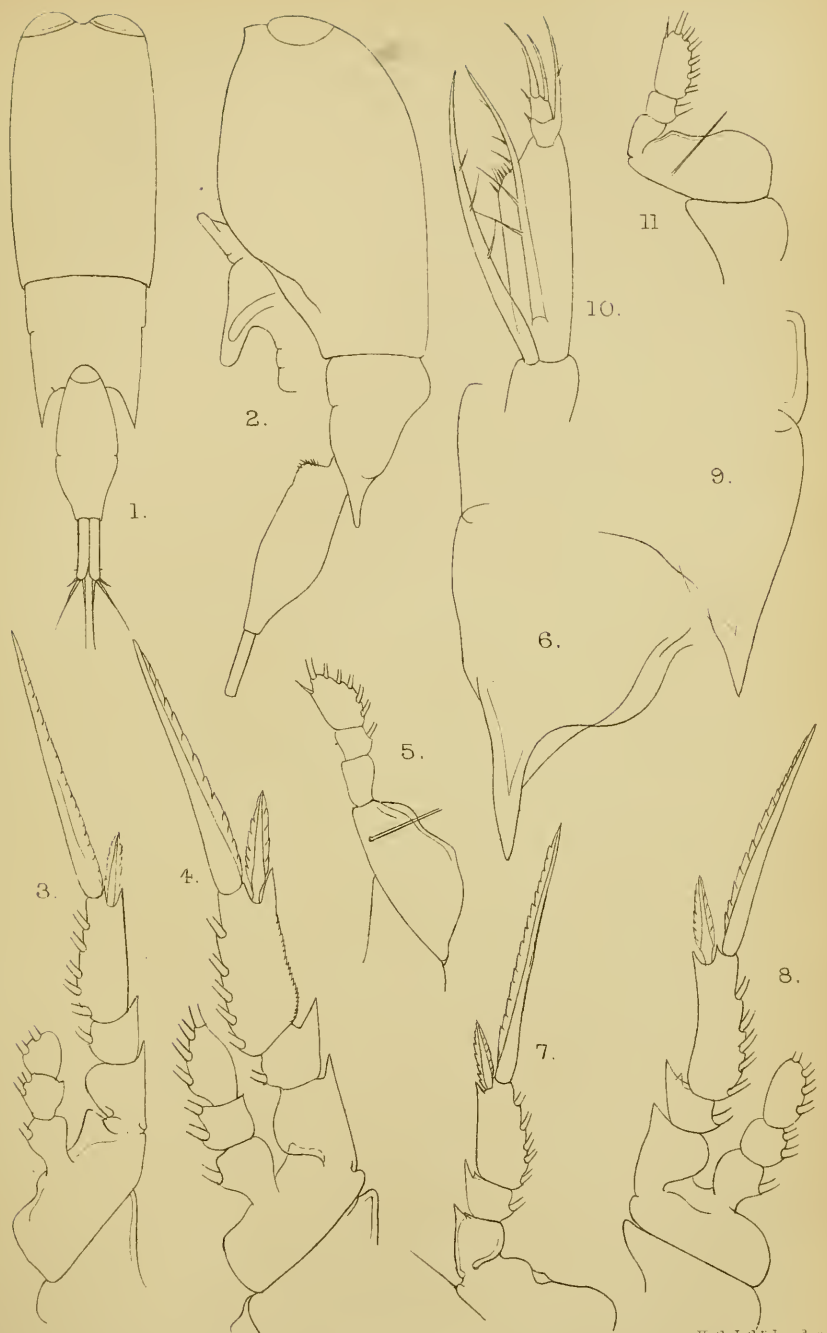
The gatherings were all made at approximately the same time (July–August, 1908) and in the same locality, on the north side of the island in shallow water near shore, and for this reason it has not been thought necessary to refer to each of them separately.

The collection, though small in bulk, is exceedingly rich in species, and the genus *Coryceus* is especially well represented.

It has been recognized that there are, in the the genus *Coryceus*, two groups differing from each other in several distinct characters, the most notable being the form of the ventral process, situated between the maxillipedes and the first pair of

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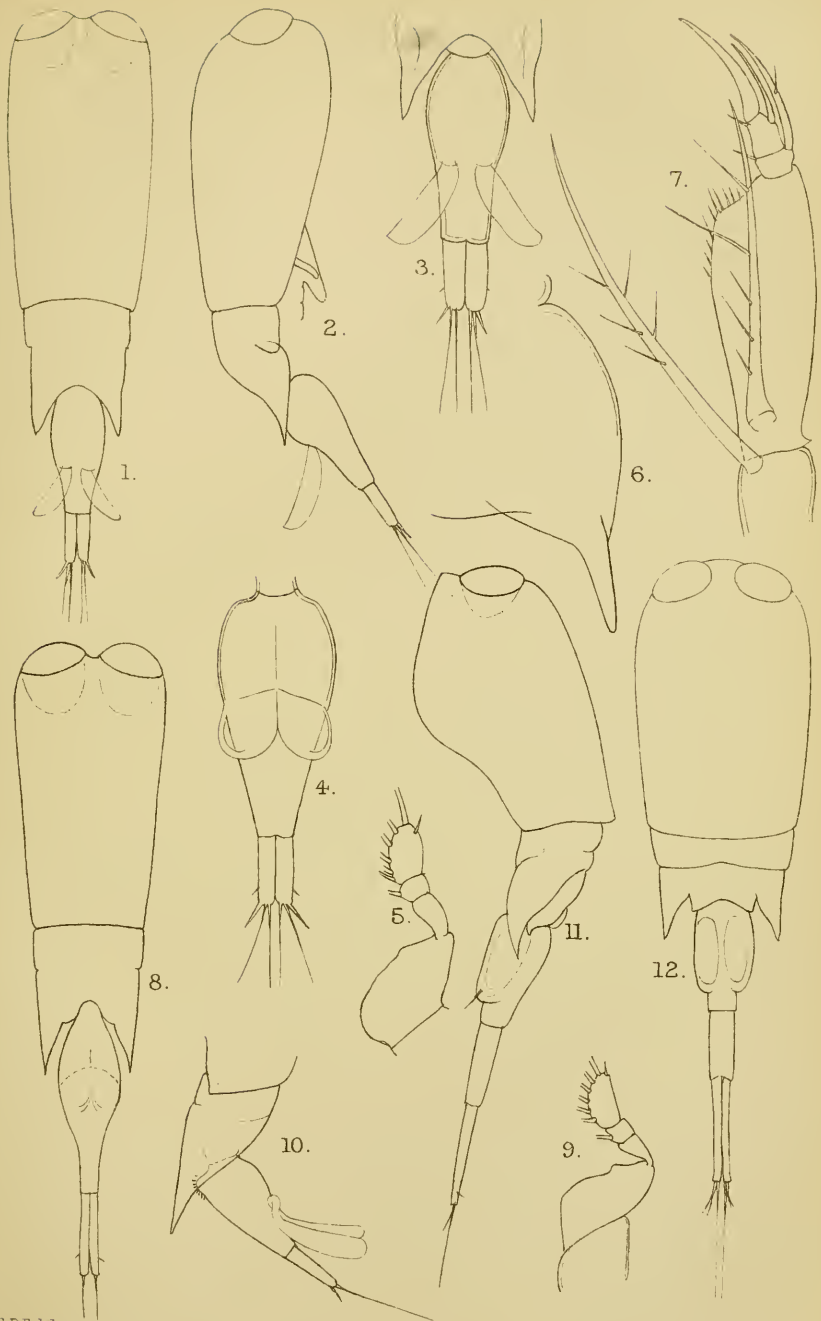
† For explanation of the Plates see p. 296.



G.P.F. del

Bath. Lith. London

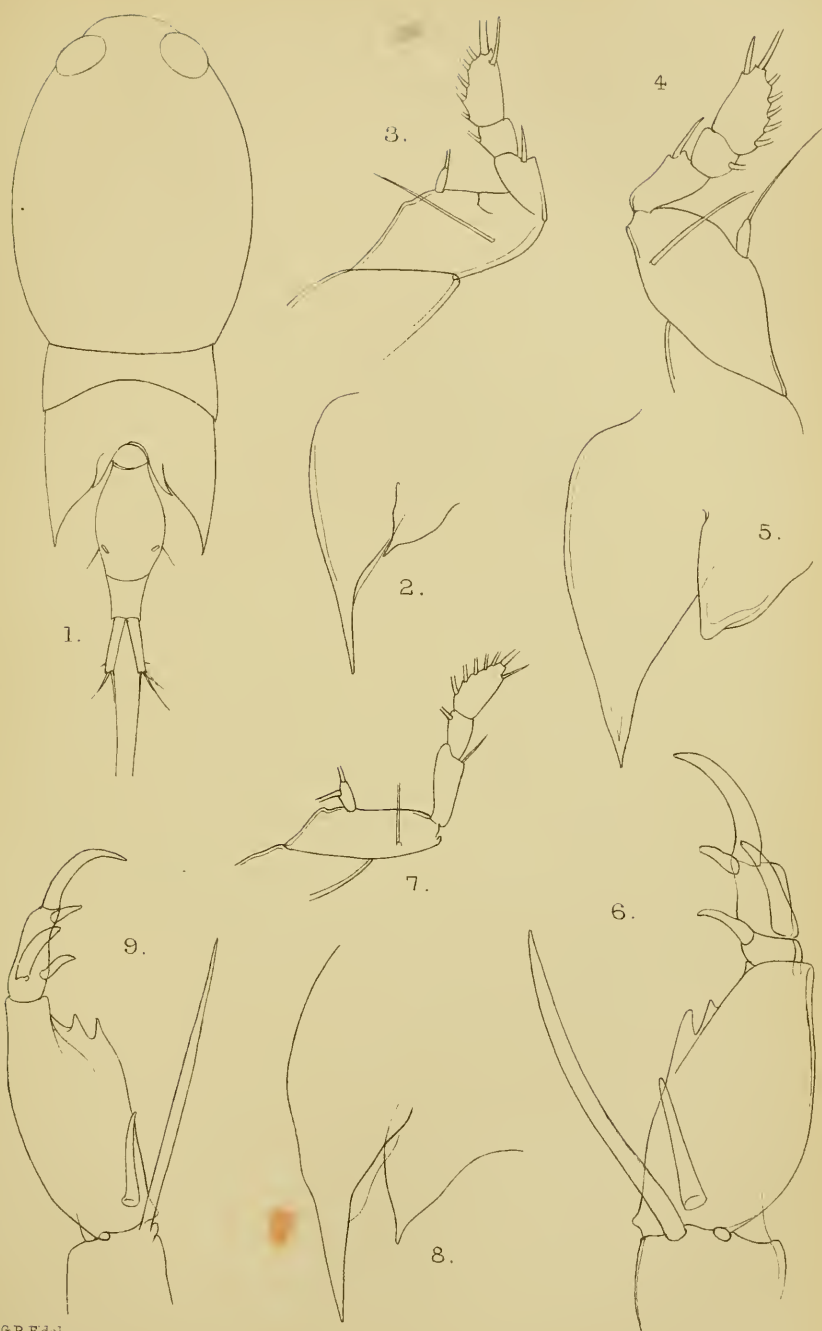
1—6. *CORYCELLA BREVIS*.
7—11. *CORYCELLA CURTA*.



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Hutchings London.

1-6. *CORYCELLA CURTA*. 7. *C. BREVIS*.
 8, 9. *CORYCELLA* sp. ♂ 10. *C. CARINATA*.
 11, 12. *CORYCAEUS GRACILICAUDATUS*.



G.P.F. del.

Hutch. Inst. London

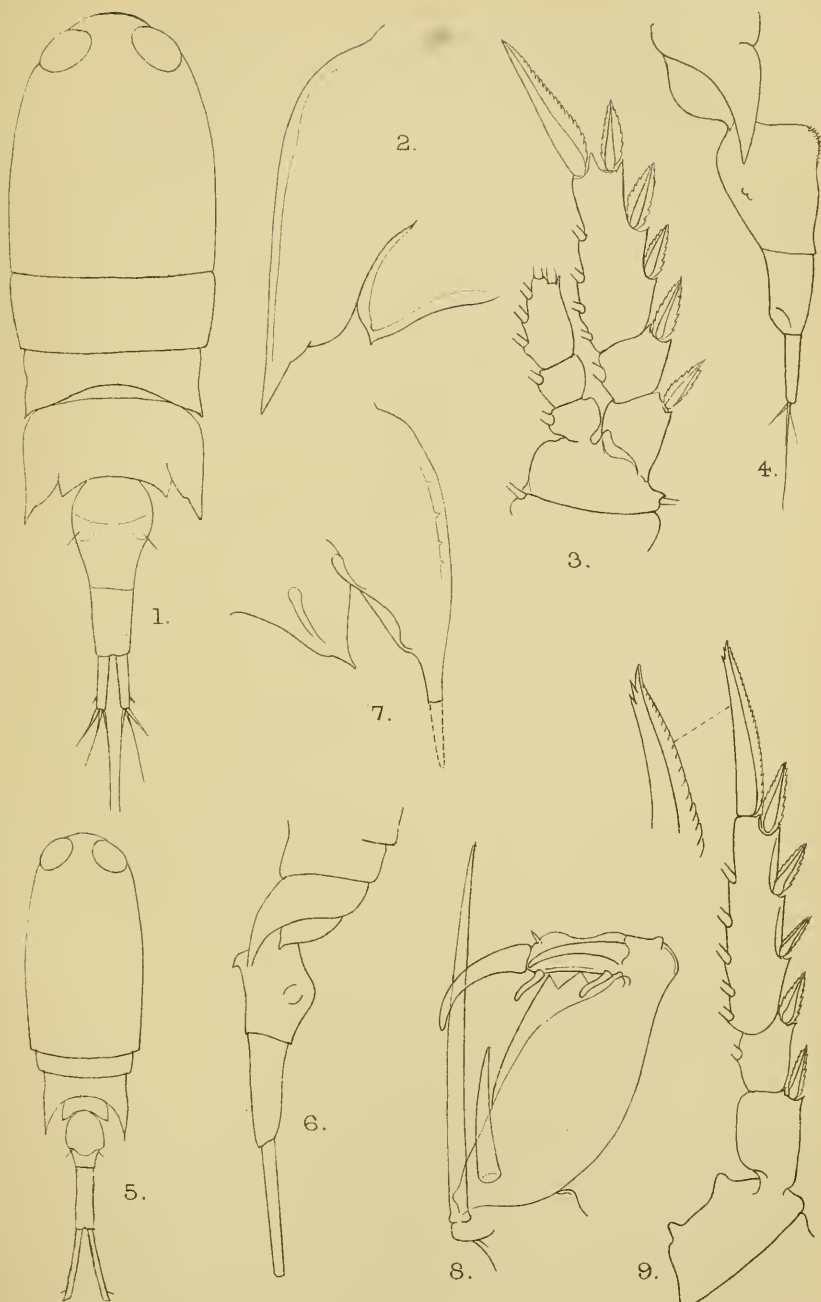
1-3. *CORYCAEUS CATUS* 4-6. *C. OBTUSUS*
 7. *C. DUBIUS*. 8-9. *C. TENUIS*.



G.P.F. del.

Huth, Luth^r London.

1-6. *CORYCAEUS MURRAYI*.
7-9. *C. ANDREWSI*.



G.P.F. del

1-4. CORYCAEUS ANDREWSI.
5-9. C. DUBIUS.

Huth, Lith^r London.

feet of the female, which is beak-shaped in one group and semi-circular in the other. There can be no doubt that these characters are, collectively, of generic importance, and I propose the name *Corycella* for that subdivision, as typified by *C. gibbulus*, which is marked by the possession of a beak-shaped ventral process, leaving the name *Corycæus* for the remaining species, of which *C. speciosus* may be selected as the type.

The genus *Corycæus* was founded by Dana in 1845 (6), his diagnosis being repeated in 1846 (7), but no species belonging to the genus was described till 1849 (8). Dana's definition of the genus includes both the genera defined above, and his papers describing the species, first published without figures in 1849 (8), and afterwards with figures in 1852 (9), contain forms belonging to both *Corycella* and *Corycæus*, but do not indicate any one of them as forming the type of the genus.

The principal differences between *Corycæus* and *Corycella* may be summarized as follows:—

Genus *CORYCELLA*, nov.

Abdomen of ♂ and ♀ one-jointed; 4th thoracic segment without lateral points, not distinct from 3rd thoracic segment. Ventral process beak-shaped in ♀. 2nd antenna with setæ on 1st and 2nd basal joints distantly feathered; terminal spine short in ♂; inner edge of 2nd basal coarsely feathered.

1st to 3rd feet, exopodite with 0.0.1 outer edge setæ.

4th foot without endopodite, exopodite with 0.0.1 outer edge setæ.

Genus *CORYCÆUS* Dana.

Abdomen of ♂ and ♀ usually two-jointed; 3rd and 4th thoracic segments distinctly separate, the latter with lateral points. Ventral process semi-circular in ♀. 2nd antenna with the setæ on 1st and 2nd basal joints not feathered; terminal spine elongated in ♂, inner edge of 2nd basal usually with one or more strong teeth.

1st to 3rd feet, exopodite with 1.1.3 outer edge setæ.

4th foot with endopodite bearing one or two setæ, exopodite with 0.1.1 outer edge setæ.

The one-jointed abdomen and the feathered setæ of the second antennæ occur, as Dahl has pointed out, as characters of immaturity in the genus *Corycæus*.

Giesbrecht (10) recognises five species of *Corycæus* in the group for which the name *Corycella* is proposed, viz., *C. gibbulus* Giesbr., *C. concinnus* Dana, *C. rostratus* Claus, *C. carinatus* Giesbr., and *C. longicaudis* Dana.* In Dahl's revision of the genus (5) he accepts *C. gibbulus*, *C. concinnus*, *C. carinatus*, *C. rostratus*, and, under the new name of *C. tenuicauda*, *C. longicaudis*, asserting that Dana's description of *C. longicaudis* really refers to *C. speciosus* juv., a view which is strongly supported by Dana's figures. Dahl also recognises Dana's (8) description of *C. gracilis* as being good, but does not give any reason for this opinion. Dana's description and figures of *C. gracilis* evidently refer to a male of *Corycella*, but the specific differences between the males of this genus are so slight that it does not appear possible to refer the description and figures with certainty to any particular species. Dahl's belief that *C. pellucidus* of Dana is the female of what he recognises as *C. gracilis* also appears to be a mere conjecture, there being very little evidence for or against

the view in Dana's figures, which, apparently, include two different species.

Wolfenden (11) also believes that he has recognised the *C. pellucidus* of Dana, but his figures and descriptions refer undoubtedly to the species which Giesbrecht has described as *C. gibbulus*.

Dahl, in the paper referred to above (5), which is a preliminary note on the Copepoda of the Plankton Expedition, has drawn up a useful diagnostic table of the members of the genus *Corycaeus* as recognised by him. The portion which refers to the genus *Corycella* has been translated by Dr. Wolfenden (11) in his account of the Maldive Copepoda. In this table Dahl gives as a mark to distinguish the other members from *C. rostratus*, "Viertes Beinpaar mit einem inneren Zapfen welcher eine Borste trägt." If by "Zapfen" is meant endopodite, as is undoubtedly the case in the latter part of the table, and as Wolfenden translates it, this statement is an error, as the endopodite is absent throughout the group. There is a mistranslation in Wolfenden's table which detracts somewhat from its usefulness; the sentence "Genital openings of ♀ set at end of abdomen" should read "distant from end of abdomen," "vom Ende des Abdomens entfernt."

The specific characters in the genus *Corycella* are very slight and depend mainly on the shape of the abdomen and the third thoracic segment. The following is an attempt to draw up a diagnostic table, to include the females of which a recognisable description exists and two new species from the Christmas Island collection, which are described below.

- | | |
|---|---------------------------|
| 1. Furca only twice as long as broad..... | <i>C. rostrata</i> . |
| 2. Furca three or more times as long as broad. | |
| A. Furca shorter than widest part of abdomen in dorsal view. | |
| a. Widest part of abdomen behind the middle, 3rd thoracic segment with dorsal hump. | |
| a. Abdomen less than twice as long as high in lateral view, median furcal spine short and stout | <i>C. gibbula</i> . |
| β. Abdomen ca. $2\frac{1}{2}$ times as long as high in lateral view, median furcal spine slender..... | <i>C. brevis</i> , sp. n. |
| b. Widest part of abdomen in front of middle, 3rd thoracic segment not humped dorsally. | |
| a. Thoracic spines long, abdomen with ventral setose pad | <i>C. carinata</i> . |
| β. Thoracic spines short, abdomen without setose pad ... | <i>C. curta</i> , sp. n. |
| B. Furca longer than widest part of abdomen. | |
| a. Furca less than half as long as abdomen, 3rd thoracic segment with dorsal hump | <i>C. longicaudis</i> . |
| b. Furca less than half as long as abdomen, 3rd thoracic segment without dorsal hump | <i>C. concinna</i> . |

CORYCELLA GIBBULA Giesbr.

Corycaeus gibbulus Giesbrecht (10).

Corycaeus pellucidus Wolfenden (11).

? *Corycaeus megalops* Will.-Suhm (1).

Common in all the gatherings, upwards of 120 specimens.

The most easily recognised characters of the female of this

species are the deep cephalon with eyes rather small and set far apart, the abdomen widest at its posterior third (without furca) and usually bearing two spermatophores, the furca contained $2\frac{1}{4}$ times in the rest of the abdomen, the middle furcal seta thick and equal in length to the width of the furca, and the setose pad on the antero-ventral part of the abdomen.

Wolfenden (11. p. 1027) has described at some length a female *Corycaeus* which occurred plentifully in the Maldive collections, and which is apparently identical with the above. He ascribes it to *C. pellucidus* Dana, and records *C. gibbulus* as a separate species. He remarks, however, that he believes that the *C. pellucidus* of the Maldive collections is probably identical with *C. gibbulus*. His figure of the fourth foot (fig. 9, pl. xcix.) is evidently incorrect in showing an endopodite bearing a long seta, as in the text it is said that no endopodite is present.

Giesbrecht's (10) figure of the female abdomen of *C. gibbulus* in lateral view is not so deep nor so irregular in outline as are all my specimens; in this they agree more nearly with Wolfenden's figure, but I think there can be no doubt that all these forms are identical.

It seems not improbable that Willemoes-Suhm's *C. megalops* was in reality this species, but his description and figure, as given by Brady (1), can hardly be regarded as constituting a valid diagnosis. Brady's *C. pellucidus* may also include it with others.

Distribution. Red Sea, Arabian Sea, Indian Ocean (many records), and Tropical Pacific.

CORYCELLA BREVIS, sp. n. (Pl. X. figs. 1-6, Pl. XI. fig. 7.)

Female (Pl. X. figs. 1, 2).—Length .85 mm.; cephalothorax, in middle line, .54 mm.; abdomen and furca .3 mm.; cephalon rather deep, curved dorsally in lateral view; eyes large, prominent in dorsal view.

2nd thoracic segment with slight dorsal hump, as in *C. gibbula* and *C. longicaudis*.

3rd thoracic segment (Pl. X. fig. 6) with comparatively short lateral points.

Abdomen widest at its posterior $\frac{2}{3}$ excluding furca; in lateral view the abdomen is parallel-sided for about $\frac{2}{3}$ of its length, and is then tapered to the furca; it has a slightly spinulose antero-ventral boss.

Furca about 6×1 , contained $2\frac{1}{3}$ times in rest of abdomen; its median terminal spine not very strong, about twice as long as width of furca.

1st and 2nd antennæ (Pl. XI. fig. 7) as in *C. gibbula*.

1st to 3rd feet (Pl. X. figs. 3, 4) almost the same as in *C. gibbula*. The 3rd joints of the exopodites of the 1st and 2nd feet are finely serrate, in the 3rd foot the serrations are not visible.

4th foot (Pl. X. fig. 5) as in *C. gibbula*, hollowed on distal margin of 2nd basal; inner margin of the 2nd basal forms an acute angle with its base.

The characters which distinguish this species from *C. gibbula* are the proportionately greater length and different form of the abdomen and the shorter 3rd thoracic spines.

Only one specimen was found.

CORYCELLA CONCINNA Dana.

In five gatherings, about 30 specimens.

Giesbrecht (10) has given a figure of the female of this species by which it can easily be recognised, but he does not refer to the presence of a setose pad, as in *C. gibbula*, on the antero-ventral part of the abdomen.

Distribution. Widely distributed in the Indian Ocean, Tropical and South Pacific.

CORYCELLA CARINATA Giesbr. (Pl. XI. fig. 10.)

In five gatherings, 55 specimens.

Length of females .85 mm.

The characteristic features of this species are the cephalon (deep from front to back), the small eyes moderately far apart, the long slender thoracic spines, and the abdomen, widest at its anterior fourth (excluding furca), with a ventral setose pad. The furca is about half as long as the rest of the abdomen.

CORYCELLA CURTA, sp. n. (Pl. X. figs. 7-11, Pl. XI. figs. 1-6.)

Female (Pl. XI. figs. 1, 2).—Length .7 mm. Very close in general appearance to *C. carinata*, but may be distinguished by the more slender build in lateral view, by the shorter thoracic spines, which do not reach as far as the genital openings, and by the absence of the patch of fine setæ or spinules on the antero-ventral part of the abdomen.

The furca is short, about 2×7 , and contained $2\frac{1}{2}$ times in the length of the rest of the abdomen (Pl. XI. fig. 3), which is broadest at its anterior fourth and tapered posteriorly.

The appendages have no special features. The fine serrulation, found on the third joints of the exopods in some species, is absent (Pl. X. figs. 7, 8). The 2nd basal of the fourth foot (Pl. X. fig. 11) is rounded on its inner face, and does not form one straight line with the inner face of the 1st basal. The angle between the base and inner margin of the 2nd basal is slightly obtuse.

Only one specimen was found.

In the same gathering there occurred two specimens which seem to be the males of the above, on account of the similarity of their thoracic spines, fourth feet and furca, and their small size.

Male (Pl. XI. figs. 4-6). Length .65 mm. Cephalothorax in middle line .4 mm., abdomen and furca .24 mm. The form of the abdomen (Pl. XI. fig. 4) is more easily shown in the figure than described. The outer edges of the 3rd joints of the exopodites of 1st and 3rd feet are not serrulate. The angle between the base and inner margin of the 2nd basal of the 4th foot (Pl. XI. fig. 5) is slightly obtuse.